Center Independent Research & Development: GSFC IRAD

A Test-as-You-Fly X-ray Pulsar Navigation Capability for Advanced Exploration Systems

Completed Technology Project (2017 - 2020)

Project Introduction

This project will establish a hardware-in-the-loop testing capability for X-ray Pulsar Navigation (XNAV) in the context of the Johnson Space Center (JSC) Orion Optical Navigation (OON) testbed, and to identity a practical XNAV sensor package targeting cis-lunar operations for Orion EM2/3 and lunar habitat modules. This effort will leverage software developments from the Station Explorer for Navigation and Timing Technology (SEXTANT) and hardware concepts from the Neutron-star Interior Composition Explorer (NICER) mission.

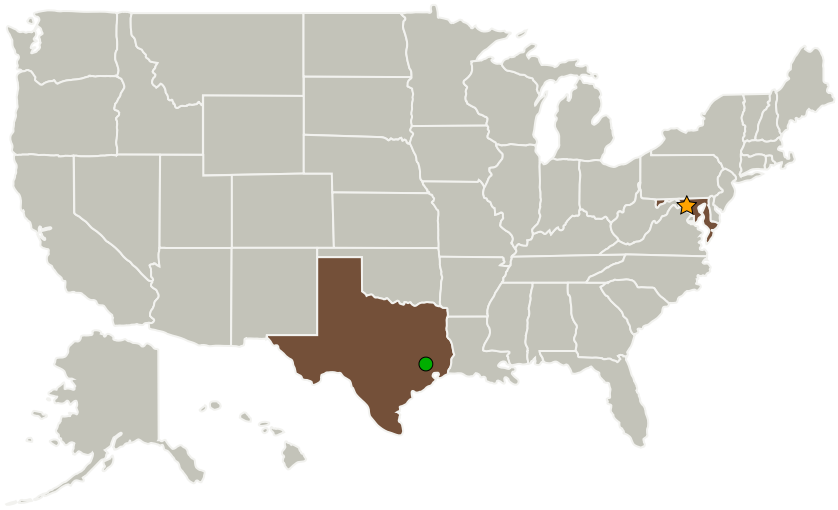
Anticipated Benefits

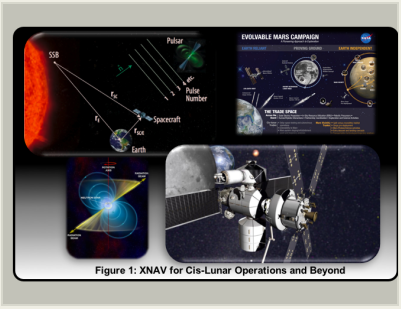
Missions operating far from Earth including crewed and uncrewed missions need to operate and navigate autonomously with minimal support from the ground.

A XNAV sensor complements other on-board optical navigation sensors, provide an accurate timing source for Mars and deep space missions.

In addition, the XNAV sensor can serve a dual purpose, as a science sensor aiding the astrophysics (X-ray astronomy) community in performing science outside of LEO.

Primary U.S. Work Locations and Key Partners





XNAV for Cis-Lunar Space Operations and Beyond

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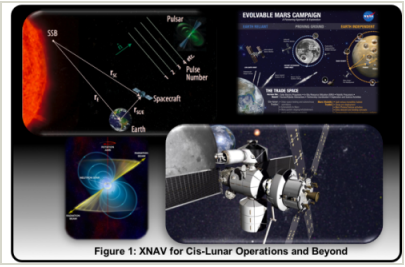
Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
●Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Maryland	Texas

Images



XNAV for Cis-Lunar Space and Beyond
XNAV for Cis-Lunar Space Operations and Beyond *(https://techport.nasa.gov/image/38871)*

Organizational Responsibility

Responsible Mission Directorate:
Mission Support Directorate (MSD)

Lead Center / Facility:
Goddard Space Flight Center (GSFC)

Responsible Program:
Center Independent Research & Development: GSFC IRAD

Project Management

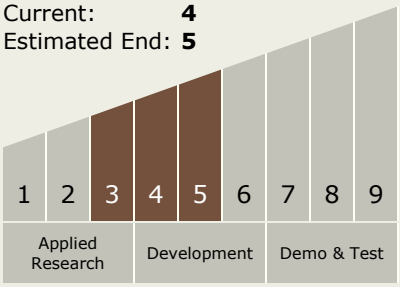
Program Manager:
Peter M Hughes

Project Managers:
Jason W Mitchell
Timothy D Beach

Principal Investigator:
Sean R Semper

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **5**



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.4 Network Provided Position, Navigation, and Timing
    - TX05.4.2 Revolutionary Position, Navigation, and Timing Technologies

Target Destinations

The Moon, Mars, Others Inside the Solar System